POLYAMIDE [PA 6 + MOS₂] .ATRON® GSM



NYLATRON GSM contains finely divided particles of molybdenum disulphide to enhance its bearing and wear behaviour without impairing the impact and fatigue resistance inherent to unmodified cast nylon grades. It is a very commonly used grade for gears, bearings, sprockets

Physical properties (indicative values*)

Density	PROPERTIES	Test method ISO/(IEC)	s Units	VALUES
Density 1183 g/cm² 1.16 Water absorption:	Colour	_	_	grey-black
- after 24/96 h immersion in water of 23°C (1) 62 mg 52/98	Density	1183	g/cm³	1.16
- at saturation in air of 23°C / 50% RH	Water absorption:			
- at saturation in air of 23°C / 50% RH - at saturation in water of 23°C	– after 24/96 h immersion in water of 23°C (1)		•	,
- at saturation in water of 23°C		62		,
Melting temperature	· · · · · · · · · · · · · · · · · · ·	_		
Melting temperature			%	0.7
Thermal conductivity at 23°C Coefficient of linear thermal expansion:	Thermal Properties (2)			
Coefficient of linear thermal expansion: - average value between 23 and 60°C		_		
- average value between 23 and 100°C - my/(m· K) 80\10^b - verage value between 23 and 100°C - my/(m· K) 90\10^b - my/(m· K)	y .		W/(K⋅m)	0/30
- average value between 23 and 100°C Temperature of deflection under load:	· ·		// 1/2	
Temperature of deflection under load:		_	, , ,	/
method A: 1.8 MPa	<u> </u>		m/(m·K)	90 · 10 %
Max. allowable service temperature in air:	· ·	+ 75	۰۲	80
- for short periods (3) - continuously; for 5,000/20,000 h (4) - °C 105/90 Min. service temperature (5) Flammability (6): - "Oxygen Index" 4589 % 25 - according to UL 94 (3/6 mm thickness) - HB/HB/ Mechanical Properties at 23°C (7) Tension test (8): - tensile stress at yield (9) + 527 MPa 500 - tensile strain at break (9) + 527 MPa 500 - tensile modulus of elasticity (10) + 527 MPa 500 - tensile strength - Notched		1 73		<u> </u>
Min. service temperature (5) -30 Flammability (6):	l ·	_	/%	170
Flammability (6):	– continuously: for 5,000/20,000 h (4)	_	1.05	105/90
- "Oxygen Index" - according to UL 94 (3/6 mm thickness) Mechanical Properties at 23°C (7) Tension test (8): - tensile stress at yield (9) - tensile strain at break (9) - tensile modulus of elasticity (10) Compression test (11): - compressive stress at 1/2/5% nominal strain (10) Creep test in tension (8): - stress to produce 1% strain in 1,000 h (9/1,600) Charpy impact strength – Unnotched (12) Charpy impact strength – Notched Charpy im	Min. service temperature (5)) /-30
HB/HB Mechanical Properties at 23°C (7)			\'	~/ /
Mechanical Properties at 23°C (7) Tension test (8): - tensile stress at yield (9)		4589	%	• //
Tension test (8):	– according to UL 94 (3/6 mm thickness)	<i>*</i>	_	нв/нв
- tensile stress at yield (9)	Mechanical Properties at 23°C (7)			
- tensile strain at break (9) - tensile strain at break (9) - tensile modulus of elasticity (10) - tensi	Tension test (8):			10
- tensile strain at break (9) - tensile modulus of elasticity (10)	– tensile stress at yield (9)	+ 527	MPa	// (78 <
- tensile modulus of elasticity (10) - tensile modulus of elasticity (16000 - tensile modulus of elasticity (1600		+++ 527		\$50
- tensile modulus of elasticity (10)	– tensile strain at break (9)		// `	(-)
Compression test (11):			%/	/ / /
Compression test (11): - compressive stress at 1/2/5% nominal strain (10) + 604 MRa 25/49/88 Creep test in tension (8): - stress to produce 1% strain in 1,000 h ($\sigma_{1/1000}$) + 899 MPa 21 - stress to produce 1% strain in 1,000 h ($\sigma_{1/1000}$) + 899 MPa 9 Charpy impact strength – Unnotched (12) + 199/1eA kJ/m² 3.5 Load impact strength – Notched + 180/2a kJ/m² 3.5 Izod impact strength – Notched + 180/2a kJ/m² 3.5 Hall indentation hardness (13) + 2639-1 N/mm² 160 Rockwell hardness (13) + 2639-1 N/mm² 160 Rockwell hardness (13) + (60243) kV/mm 24 Volume resistivity + (60243) kV/mm 16 Volume resistivity + (60093) Ω·cm > 1014 + (60093) Ω·cm > 1014 + (60093) Ω·cm > 1012 Surface resistivity + (60093) Ω·cm > 1012 Relative permittivity ε _r : - at 1 0 Hz + (60250) <td>- tensile modulus of elasticity (10)</td> <td></td> <td>MPa</td> <td>//.</td>	- tensile modulus of elasticity (10)		MPa	//.
- compressive stress at 1/2/5% nominal strain (10)	Compression test (11):	77 327	Inte d	1,000
Creep test in tension (8): stress to produce 1% strain in 1,000 h ($\Omega_{1/1000}$) + 899 MPa 9 Charpy impact strength – Unnotched (12) + 19/1eU KJ/m² no break Charpy impact strength – Notched + 19/1eU KJ/m² 3.5 Izod impact strength – Notched + 180/2A kJ/m² 7 Ball indentation hardness (13) 2039-1 N/mm² 160 Rockwell hardness (13) + 2039-2 M 84 Electrical Properties at 23 °C Electric strength (14) + (60243) kV/mm 24 Volume pesistivity + (60243) kV/mm 16 Volume pesistivity + (60093) Ω·cm > 1014 Volume pesistivity + (60093) Ω·cm > 1012 Surface resistivity + (60093) Ω·cm > 1012 Relative permittivity $ε_r$: - at 1 MHz + (60250) - 3.6 +	' ' '	+ 604	/ MRa	> 25/49/88
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- stress to produce 1% strain in 1,000 h ($9_{1/1,000}$)	+ 899/	MP ₃	21
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			7	9
Izod impact strength - Notched			$\overline{}$	
Ball indentation hardness (13)		/ //		
Ball indentation hardness (13) $\frac{2039}{1}$ N/mm² 160 Rockwell hardness (13) + 2039-2 - M 84 Electrical Properties at 23°C + (60243) kV/mm 24 Electric strength (14) + (60243) kV/mm 16 Volume resistivity + (60093) Ω · cm > 1014 Volume resistivity + (60093) Ω · cm > 1012 Surface resistivity + (60093) Ω · cm > 1012 Relative permittivity $ε_r$: - at 100 Hz + (60250) - 3.6 - at 1 MHz + (60250) - 3.2 + + (60250) - 3.7 Dielectric dissipation factor tan δ: - at 100 Hz + (60250) - 0.012 + (60250) - 0.016 + (60250) - 0.016 + + (60250) - 0.016 + + (60250) - 0.016 + + (60250) -	Izod impact strength – Notched		, .	
Rockwell hardness (13) + 2039-2 — M 84 Electrical Properties at 23°C Electric strength (14) + (60243) kV/mm 24 + (60243) kV/mm 16 Volume resistivity + (60093) Ω · cm > 1012 Surface resistivity + (60093) Ω · cm > 1012 Relative permittivity $ε_r$: - at 100 Hz + (60250) — 3.6 - - at 1 MHz + (60250) — 3.2 ++ (60250) — 3.7 Dielectric dissipation factor tan δ: - at 100 Hz + (60250) — 0.012 ++ (60250) — 0.014 - - 0.016 -	Ball indentation hardners (12)	//		
Electrical Properties at 23°C Electric strength (14)		+ 2039-2	- N/ IIIII-	
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Electric strength (14)	, ,	,	
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	volume resistivity	, ,		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Surface resistivity			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Surface resistivity	/ ' '		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Relative permittivity ε_r : – at 100 Hz			
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	- at 1 MHz		-	
++ (60250) - 0.14 - at 1 MHz + (60250) - 0.016 ++ (60250) - 0.05 Comparative tracking index (CNI) + (60112) - 600			——————————————————————————————————————	
- at 1 MHz// + (60250) - 0.016 ++ (60250) - 0.05 Comparative tracking index (CTI) + (60112) - 600	Dielectric dissipation factor tan δ: – at 100 Hz			
++ (60250) — 0.05 Comparative tracking index (CTL) + (60112) — 600	///		-	
Comparative tracking index (CTI) + (60112) - 600	- at 1 MHz///			
	Comparative tracking index (NT)		_	
TT (00112) — 000	Comparative tracking index (CN)			
		++ (00112)		000

Note: 1 g/cm3 = 1,000 kg/m3; 1 MPa = 1 N/mm2; 1 kV/mm = 1 MV/m

Availability

Round Rods: Ø 50-500 mm - Plates: Thicknesses 10-100 mm - Tubes: 0.D. 50-600 mm - Discs: up to 1200 mm - Rectangular Blocks: up to 1000 wide x 1000 long x 200 mm thick - Rings: up to 0.D. 2150 mm

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Legend

- +: values referring to dry material
- ++: values referring to material in equilibrium with standard atmosphere 23°C/50 % RH/(mostly derived from
- According to method 1 of ISO 62 and done on discs Ø 50 x
- The figures given for these properties are for the most part material supplier data and other derived from raw
- Only for short time exposure (a few hours) in applications where no or only a very low load is applied to the material.

 Temperature resistance over a period of 5,000/20,000 hours. After these periods of time, there is a decrease in tensive strength of about 50% as compared with the oxiginal value. The temperature values given here are thus based on the thermal-oxidative degradation which takes place and causes a reduction in properties. Note, however, that, as for all thermoplastics, the maximum allowable service temperature depends in many cases essentially on the duration and the magnitude of the mechanical stresses to which the material is subjected.
- Impact strength decreasing with decreasing temperature, the minimum allowable service temperature is practically mainly determined by the extent to which the material is subjected to impact. The value given here is based on unfavourable impact conditions and may consequently not be considered as being the absolute practical limit.
- (6) These estimated ratings, derived from raw material supplier data, are not intended to reflect hazards presented by the materials under actual fire conditions. There is no ULyellow card available for NYLATRON GSM stock shapes.
- (7) The figures given for the properties of dry material (+) are for the most part average values of tests run on test specimens machined out of rods Ø 40-60 mm.
- Test specimens: Type 1 B.
- (9) Test speed: 20 mm/min.
- (10) Test speed: 1 mm/min.
- (11) Test specimens: cylinders Ø 12 x 30 mm.
- (12) Pendulum used: 15 J.
- (13) 10 mm thick test specimens
- (14) Electrode configuration: 25/75 mm coaxial cylinders; in transformer oil according to IEC 60296; 1 mm thick test
- This table is a valuable help in the choice of a material. The data listed here fall within the normal range of product properties. However, they are not quaranteed and they should not be used to establish material specification limits nor used alone as the basis of design.

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